

WHAT IS CLAIMED IS

1. A method for etching an organic insulating film in which a first RF power having a first frequency is applied to a first electrode with an object-to-be-processed having an organic insulating film mounted on, a second RF power having a second frequency different from the first frequency is applied to a second electrode opposed to the first electrode, whereby plasma of gas containing NH_3 is generated to etch the organic insulating film,

the first RF power and the second RF power being controlled to make a Vpp value of a voltage applied to the first electrode below 500 V.

2. A method for etching an organic insulating film according to claim 1, wherein

a pressure in a plasma processing chamber where the plasma is generated is controlled to be below 100 mTorr.

3. A method for etching an organic insulating film according to claim 1, wherein

a flow rate of an NH_3 gas is controlled to be below 50 sccm.

4. A method for etching an organic insulating film according to claim 2, wherein

a flow rate of an NH_3 gas is controlled to be below 50 sccm.

5. A method for etching an organic insulating film according to claim 1, wherein

a cross-sectional etching profile of the organic insulating film is controlled by the second RF power.

6. A method for etching an organic insulating film according to claim 1, wherein

the first RF power and the second RF power are controlled to make a sum of a Vdc value and the Vpp value of the voltage to be applied to the first electrode below 500 V.

7. A method for etching an organic insulating film according to claim 1, wherein

a gap between the first electrode and the second electrode is further controlled to make the Vpp value below 500 V.

8. A method for etching an organic insulating film according to claim 6, wherein

a gap between the first electrode and the second electrode is further controlled to make the sum of the Vdc value and the Vpp value below 500 V.

9. A method for etching an organic insulating film according to claim 1, wherein

the second RF power is higher than the first RF power.

10. A method for etching an organic insulating film according to claim 1, wherein

the second frequency is larger than the first frequency.

11. A method for fabricating a semiconductor device comprising the step of:

sequentially forming an organic insulating film and an inorganic insulating film on a substrate;

patterning the inorganic insulating film; and

etching the organic insulating film with the patterned inorganic insulating film as a mask,

in the step of etching the organic insulating film, a method for etching the organic insulating film in which a first RF power having a first frequency is applied to a first electrode with the substrate mounted on and a second RF power having a second frequency different from the first frequency is applied to a second electrode opposed to the first electrode, whereby plasma of gas containing NH_3 is generated to etch the organic insulating film being used, and the first RF power and the second RF power being controlled so as to make a V_{pp} value of a voltage to be applied to the first electrode below 500 V.

12. A method for fabricating a semiconductor device according to claim 11, wherein

in the step of etching the organic insulating film, a pressure in a plasma processing chamber where the plasma is generated is controlled to be below 100 mTorr.

13. A method for fabricating a semiconductor device according to claim 11, wherein

in the step of etching the organic insulating film, a flow rate of an NH_3 gas is controlled to be below 50 sccm.

14. A method for fabricating a semiconductor device according to claim 12, wherein

in the step of etching the organic insulating film, a

flow rate of an NH_3 gas is controlled to be below 50 sccm.

15. A method for fabricating a semiconductor device according to claim 11, wherein

the substrate has on a surface side a first interconnection layer formed of mainly copper,

in the step of etching the organic insulating film, the organic insulating film is etched with the first interconnection layer exposed.

16. A method for fabricating a semiconductor device according to claim 11, further comprising after the step of etching the organic insulating film, the step of:

forming an interconnection layer buried in the inorganic insulating film and the organic insulating film.

17. A method for fabricating a semiconductor device according to claim 15, further comprising after the step of etching the organic insulating film, the step of:

forming a second interconnection layer buried in the inorganic insulating film and the organic insulating film.

18. A method for fabricating a semiconductor device according to claim 11, wherein

the organic insulating film has a stacked structure including two or more different organic insulating materials.